Legislative Outcomes and Malapportionment: Evidence from Latin America

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Abstract

This paper investigates the effects of malapportionment on lawmaking using the national congresses of Argentina, Brazil, and Colombia as case studies. We simulate counterfactual, well-apportioned congresses using a naïve correction method and compare them against real legislative outcomes from 2007 to 2010. We find that malapportionment alters legislative results and that partisanship acts as a mediator. Qualitative assessment indicates that party system fragmentation and partisan discipline over incumbents can either favor or weaken the winning coalition. Argentina and Colombia have the largest malapportionment indexes, while Brazil is better balanced. In Argentina's counterfactual assembly, the government party would be stronger, reducing the effective power of the opposition. Colombia presents surprisingly high malapportionment effects despite small changes in partisan seat distribution. Malapportionment effects are negligible in Brazil. This paper has implications for the design and reform of legislative institutions and for the study of constitutional democratic distortions.

Keywords: Latin America; legislative politics; malapportionment; party system; proportional representation.

JEL Codes: H10, H11, N46, Y80

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1 Introduction

While modern democracies are largely based on equal representation, states often disrespect the "one person, one vote" principle (Dahl 1973). A prime example is the allocation of seats in national legislative assemblies. For instance, in the Brazilian lower chamber, a legislator from the heavily populated state of São Paulo represents 11 times more citizens than a legislator from the outlying state of Roraima. Thus, one voter from Roraima has a much larger say in the Brazilian congress than one citizen from the country's largest state. The literature refers to this problem as *malapportionment*, which describes the difference between the share of voters in a given sub-national unit[1] and the share of congress seats that sub-national unit occupies. Samuels and Snyder (2001b) find that malapportionment is pervasive in pluralistic regimes, with new democracies in Africa and in Latin America having particularly high levels of electoral distortions (Samuels and Snyder 2004).

Following to the equal representation principle, one may believe that correcting legislative distortions is always desirable. Malapportionment is usually defended for its benefits for consociational democracy (Lijphart 1968), which arguably keeps majorities in check and grants power to weaker social segments. Moreover, reforming the distribution of seats in legislative chambers can also boost their size, inflating administrative and bureaucratic costs (Carey 2016). In contrast, advocates of strict proportionality accept higher public spending in exchange for more accurate representation. However, reapportionment efforts to increase proportionality may fall short of expectations. If correcting the seat distribution per sub-national unit causes the winning coalition to occupy an even larger share of congress, legislative decisions will likely remain the same, as the majoritarian standpoint would be further reinforced. Addressing malapportionment could thus lead towards a tyranny of the majority (De Tocqueville 2003). In this case, the representation benefits of reform disappear, generating only additional public spending and new democratic distortions (Freire et al. 2019). To properly diagnose whether malapportionment distorts representation, we need to evaluate if the disproportion changes lawmaking outcomes.

In this paper, we reapportion the Argentinian, Brazilian and Colombian lower houses and build counterfactual congresses to assess the impacts of malapportionment. We simulate proportional roll call votes and compare them to actual voting outcomes to see if malapportionment changes legislative decisions. We proceed in four steps. First, we produce W-NOMINATE scores (Poole

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[1] *States*, *provinces*, and *sub-national units* will be used interchangeably throughout this paper.

and Rosenthal 2011) by party and by sub-national unit to estimate each politician's ideal point in all roll call votes of the 2007-2010 term. Then, we propose a naïve correction of chambers' apportionment for all countries, wherein some provinces win, and others lose representatives. Using the reapportioned numbers, we estimate what would have been the partisan distribution of seats in each country's assembly. Finally, we run Monte Carlo simulations to evaluate whether the roll call votes in well-apportioned chambers differ substantially from the real malapportioned ones.

We hypothesize that malapportionment only affects lawmaking if legislators vote provincially. This means that within the same province, representatives would have similar voting patterns for most bills, because the same constituent majority holds them accountable. Nevertheless, as Argentina, Brazil and Colombia have diverse provinces and multiparty systems, we consider that malapportionment effects may be mediated by partisanship. Thus, using states' counterfactual seat allocation, we argue that malapportionment alters partisan seat distribution. In this case, the latter would be responsible for the differences in the approval and rejection rates of legislative bills.

We find that countries with highly malapportioned congresses have different legislative outcomes when they are more proportional. Because Brazil was not as malapportioned as the two other countries, and its partisan seat distribution remained balanced, the country's legislative decisions were not greatly affected. In the Argentinian case, although the province of origin informs legislative behavior, malapportionment effects have a stronger link with partisanship. Colombia's surprisingly strong effects demand further investigation, but a qualitative assessment indicates that most of the impact was caused by alterations in the winning coalition. While this study provides valuable insight to address currently malapportioned states, and helps predict how reapportioned congresses make decisions, it does not aim to make an assessment of reform efforts. Future research should pursue more realistic reform designs and evaluate when reapportionment is suitable for each case.

2   Malapportionment: Cases and Causes

Malapportionment has different explanations (Nicolau 1997). The first is intuitive: the lack of historical revisions of seat allocation. Over time, immigration or differential birth rates cause the original proportions of the assembly to no longer allocate seats according to new district populations. Thus, we may find distortions just because chambers are not periodically reapportioned.

Electoral rules are another cause of disproportionate representation. Federalism commonly

generates a strong malapportionment effect in upper houses, where each province usually has the same amount of representatives. The United States senate is a notable example, where each federal unit has two representatives regardless of state population. Moreover, for lower chambers, most countries have laws that determine the minimum and maximum number of legislators for each province. For example, according to the Argentinian law, states must have from 5 to 70 representatives in congress. During the country's democratization process, these boundaries were designed to aid the development of smaller, poorer states and keep larger, richer states' influence in check. Similar dynamics also occur in other countries. Samuels and Snyder (2001a) and Bruhn et al. (2010) suggest that pre-democratic elites who sponsored democratization implemented lower and upper boundaries to concentrate and increase their own power.

Horiuchi (2004) and Ardanaz and Scartascini (2013) show that lower taxation and less redistribution are some of the observable effects of this bias. Malapportionment commonly over-empowers legislators from more conservative, rural provinces, prone to authoritarian values. Moreover, in countries such as Brazil, politicians also have higher incentives to promote pork, as over-represented provinces are able to channel more federal funds to their constituencies by amending budgets (Zucco Jr 2009; Turgeon and Cavalcante 2014). Thus, there is an important link between a sub-national unit's characteristics and the ideology of its elected representatives. But it is hard to disentangle the two possible reasons for this effect. On the one hand, all representatives of smaller provinces, regardless of partisanship, may be more ideologically conservative. On the other hand, the conservative effect may be mediated by partisanship, wherein smaller provinces elect more representatives with conservative party labels.

Here, we study the cases of Argentina, Brazil, and Colombia. They are the three most populous countries in South America and share a number of cultural and historical similarities that favor comparison. They also have presidential, bicameral, multiparty systems, and are proportionally representative (PR) democracies. Bunker and Navia (2010) show that district magnitudes, party system fragmentation, and electoral rules (malapportionment) affect each of these country's congresses on different scales. According to different measurements of disproportionality (Rae 1967; Loosemore and Hanby 1971; Gallagher 1991), Argentina ranks the highest of the three, followed by Colombia and Brazil.

Despite being the largest, and perhaps having the largest regional differences, Brazil is the only

one of the three countries that bans regional parties. This means all parties must be active in all states to receive public funding and earn seats in the House. However, most parties are only salient in specific provinces, and do not have national projection. Argentina and Colombia both allow regional parties, which can amplify the effects of malapportionment if they advocate for minority rights or reinforce ethnic conflicts (Brancati 2008). But the influence of regional parties on policy outcomes depends on how powerful sub-national units are. In Colombia, for example, decision-making is highly centralized, so regional parties only dispute for administrative power over their constituencies. In Argentina, the party system is federalized, so regional dynamics impact the course of national politics (Gibson and Suárez-Cao 2010). Despite being a closed-list system, Argentinian voters seem to choose candidates on a highly personalistic basis (Mustapic et al. 2002). This happens because politicians can run either by joining a party or arranging a provincial political block, which can enter national elections but have a higher entry barrier (3% of votes) to earn a seat. Regional groups can thus only participate when they have substantial national influence rooted in voters' support.

All three countries have lower and upper bounds to determine the number of deputies per province. This creates significant distortions for the smallest and largest sub-national units. In Argentina, the Rio Negro province has five times as many inhabitants as Tierra del Fuego, yet both are represented by five legislators each. Meanwhile, the metropolitan Buenos Aires is underrepresented by at least 30 legislators. Brazilian malapportionment seems rooted in the same causes as Argentina's: large, underrepresented urban centers. In this case, São Paulo, Brazil's largest state, is severely penalized. Colombia's rules are similar to Argentina's, but with a 2% threshold for political blocks, more provinces, and less parties. It establishes a minimum of two seats per *departamiento* – less than Argentina's minimum of 5 and Brazil's requirement of 8 – but distorts proportionality just as much due to the high number, and low population density of small provinces. Thus, the nature of malapportionment differs from the two other countries.

3 Methods

To investigate the effects of malapportionment, we study the period between 2007 and 2010, when all three countries held elections. Brazil and Colombia elected their entire congress in 2006 and terms started in 2007. Argentina held elections for half its legislators (every two years, and election is

held for half the chamber) in 2007 and terms began in 2008. Throughout the paper, we use electoral, legislative, and census data provided by each country's governmental website. Data for Argentina's roll call votes are available on the Decada Votada application (DecadaVotada Application 2020) and on the Argentinian governmental portal (Ministerio del Interior 2020). Data for Brazil's roll call votes are available on the Brazilian Center of Analysis and Planning databases (CEBRAP 2020), and on the electoral legislation department's website for the 2007 elections (Superior Court of Electoral Justice 2020). For Colombia's roll call votes, data are available on the *Congreso Visible* project (Congreso Visible Uniandes 2020) and on the *Registraduría* platform (Registraduría Nacional de Colombia 2020).

3.1 Reapportioning Congress: Naïve Correction

Before conducting the statistical tests, we create a new distribution of seats that reduces malapportionment in each of the assemblies. Real-world politics might proceed by picking the state with the smallest deputy-to-population ratio, and use that proportion as the baseline. In countries such as Brazil, where the estimated cost of a single parliamentarian in 2018 was US\$7 million dollars per year (Brasil 2018), increasing congress size could be very detrimental to public finance, and should thus be avoided.

We propose a naïve correction of chamber sizes, because it is the fairest, most proportional means of doing this. Each state gets one representative, plus an amount proportional to its share of the national population. As we mentioned previously, this type of reform would likely not be approved by real congresses, as states that lose seats will likely veto reforms that deliberately decrease their power within the chamber. Our approach is nevertheless valid because our main goal is to identify whether proportionality – or the lack thereof – can change decision-making in national assemblies, and what are the axes (dimensions) that influence these binary outcomes. In the tables below are the original seat allocations, the counterfactual distributions, and the differences between them for Argentinian, Brazilian and Colombian congresses.

Table 1: Malapportionment in Argentina 2007 national elections

	Provinces	Seats	Population	Pop / Seats	Correction	Pop/Seats (corr)	Diff
1	Catamarca	5	367828	73565.60	2	183914	-3
2	Chubut	5	509108	101821.60	3	169702.67	-2
3	Formosa	5	530162	106032.40	3	176720.67	-2
4	La Pampa	5	318951	63790.20	2	159475.50	-3
5	La Rioja	5	333642	66728.40	2	166821	-3
6	NeuquEn	5	551266	110253.20	4	137816.50	-1
7	Rio Negro	5	638645	127729	4	159661.25	-1
8	San Luis	5	432310	86462	3	144103.33	-2
9	Santa Cruz	5	273964	54792.80	2	136982	-3
10	Tierra del Fuego	5	127205	25441	1	127205	-4
11	Jujuy	6	673307	112217.83	4	168326.75	-2
12	San Juan	6	681055	113509.17	4	170263.75	-2
13	Chaco	7	1055259	150751.29	7	150751.29	0
14	Corrientes	7	992595	141799.29	6	165432.50	-1
15	Misiones	7	1101593	157370.43	7	157370.43	0
16	Salta	7	1214441	173491.57	8	151805.12	1
17	Santiago del Estero	7	874006	124858	6	145667.67	-1
18	Entre Rios	9	1235994	137332.67	8	154499.25	-1
19	Tucuman	9	1448188	160909.78	9	160909.78	0
20	Mendoza	10	1738929	173892.90	11	158084.45	1
21	Cordoba	18	3308876	183826.44	21	157565.52	3
22	Santa Fe	19	3194537	168133.53	20	159726.85	1
23	Ciudad Buenos Aires	25	2890151	115606.04	19	152113.21	-6
24	Buenos Aires	70	15625084	223215.49	100	156250.84	30
	Total	257	40117096	156097.65	256	156707.41	
	Standard Deviation			46938.28		12906.85	
	Malapp. Index			0.14		0.01	

Table 2: Malapportionment in Brazil 2006 national elections

	Provincias	Seats	Population	Pop / Seats	Correction	Pop/Seats (corr)	Diff
1	Acre	8	707125	88390.62	2	353562.50	-6
2	Amazonas	8	3350773	418846.62	9	372308.11	1
3	Amapa	8	648553	81069.12	2	324276.50	-6
4	Distrito Federal	8	2469489	308686.12	7	352784.14	-1
5	Mato Grosso do Sul	8	2404256	300532	7	343465.14	-1
6	Mato Grosso	8	2954625	369328.12	8	369328.12	0
7	Rio Grande do Norte	8	3121451	390181.38	9	346827.89	1
8	Rondonia	8	1535625	191953.12	4	383906.25	-4
9	Roraima	8	425398	53174.75	1	425398	-7
10	Sergipe	8	2036227	254528.38	6	339371.17	-2
11	Tocantins	8	1373551	171693.88	4	343387.75	-4
12	Alagoas	9	3093994	343777.11	9	343777.11	0
13	Espirito Santo	10	3392775	339277.50	9	376975	-1
14	Piaui	10	3086448	308644.80	9	342938.67	-1
15	Paraiba	12	3753633	312802.75	10	375363.30	-2
16	Santa Catarina	16	6178603	386162.69	17	363447.24	1
17	Goias	17	5849105	344065	16	365569.06	-1
18	Para	17	7443904	437876.71	21	354471.62	4
19	Maranhao	18	6424340	356907.78	18	356907.78	0
20	Ceara	22	8450527	384114.86	23	367414.22	1
21	Pernambuco	25	8541250	341650	24	355885.42	-1
22	Parana	30	10226737	340891.23	28	365240.61	-2
23	Rio Grande do Sul	31	10576758	341185.74	29	364715.79	-2
24	Bahia	39	13633969	349588.95	38	358788.66	-1
25	Rio de Janeiro	46	15180636	330013.83	42	361443.71	-4
26	Minas Gerais	53	19159260	361495.47	53	361495.47	0
27	Sao Paulo	70	39924091	570344.16	110	362946.28	40
	Total	513	185943103	362462.19	515	361054.57	
	Standard Dev.			111503.51		18153.24	
	Malapp. Index			0.05		0.01	

Table 3: Malapportionment in Colombia's 2006 national elections

	Department	Seats	Population	Pop / Seats	Correction	Pop/Seats (corr)	Diff
1	Amazonas	2	74541	37270.50	1	74541	-1
2	Arauca	2	256527	128263.50	1	256527	-1
3	Caqueta	2	465477	232738.50	2	232738.50	0
4	Casanare	2	344027	172013.50	1	344027	-1
5	Choco	2	490327	245163.50	2	245163.50	0
6	Guainia	2	40203	20101.50	1	40203	-1
7	Guaviare	2	107934	53967	1	107934	-1
8	La Guajira	2	902386	451193	3	300795.33	1
9	Putumayo	2	337054	168527	1	337054	-1
10	San Andres y Providencia	2	75167	37583.50	1	75167	-1
11	Vaupes	2	42817	21408.50	1	42817	-1
12	Vichada	2	68575	34287.50	1	68575	-1
13	Meta	3	924843	308281	3	308281	0
14	Quindio	3	558934	186311.33	2	279467	-1
15	Sucre	3	834927	278309	3	278309	0
16	Cauca	4	1354744	338686	5	270948.80	1
17	Cesar	4	1004064	251016	3	334688	-1
18	Huila	4	1126314	281578.50	4	281578.50	0
19	Risaralda	4	941283	235320.75	3	313761	-1
20	Caldas	5	984128	196825.60	3	328042.67	-2
21	Cordoba	5	1658090	331618	6	276348.33	1
22	Magdalena	5	1235425	247085	4	308856.25	-1
23	Narino	5	1701840	340368	6	283640	1
24	Norte de Santander	5	1332335	266467	5	266467	0
25	Bolivar	6	2049083	341513.83	7	292726.14	1
26	Boyaca	6	1272844	212140.67	4	318211	-2
27	Tolima	6	1400203	233367.17	5	280040.60	-1
28	Atlantico	7	2403027	343289.57	8	300378.38	1
29	Cundinamarca	7	2598245	371177.86	9	288693.89	2
30	Santander	7	2340988	334426.86	8	292623.50	1
31	Valle del Cauca	13	4520166	347705.08	15	301344.40	2
32	Antioquia	17	6299886	370581.53	22	286358.45	5
33	Bogota	18	7363782	409099	25	294551.28	7
	Territorial Total	161	47110186	292609.85	166	283796.30	
	Black Descendants	2			2		
	Foreigner Colombians	1			1		
	Native Colombians	1			1		
	Political Minorities	1			1		
	Total	166			171		
	Standard Dev.			121017.10		91721.14	
	Malapp. Index			0.14		0.04	

This correction strategy effectively builds well-apportioned congresses. The number of legislators in each chamber is minimally altered. Malapportionment indexes[2] drop from .14 to .01 in Argentina, from .05 to .01 in Brazil, and from .14 to .04 in Colombia. Despite the improvement in the index, the Colombian case is the least successful, as malapportionment remains relatively high compared to the other two countries. We attribute this to the existence of many small *departamientos*, which are sparsely populated. Casanare's single legislator represented 8.6 times more citizens than Guainia's deputy, even after redistributing the seats. In Argentina and Brazil, large, urbanized sub-national units are underrepresented due to caps, while small, rural units are over-represented because of elevated minimum seat allocation.

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[2]The malapportionment index is calculated by adding the absolute value differences between the proportion of votes contained in a sub-national unit and the proportion of seats that sub-national unit possesses, and dividing this sum by two.

3.2 Statistical Analysis

The literature on congressional voting has two contrasting views on legislators' behavior. On the one hand, malapportionment might affect congresses due to provincial behavior, and on the other hand, it might influence decisions because states have differential party preferences (Uslaner and Zittel 2006). According to the first view, representatives from the same province will present similar voting patterns during their terms, because they represent the same constituency's interests.[3] If this were the case, correcting malapportionment should have strong effects on legislative dynamics. In Argentina's counterfactual congress, if the three most populous states (Buenos Aires, Ciudad Buenos Aires and Cordoba) vote homogeneously, a simple majority can be formed by only 3 of the 24 sub-national units. According to the second viewpoint, representatives do not vote provincially, but according to partisanship. Then, apportionment could change roll call voting outcomes if partisan preferences between provinces vary significantly. This means that seat distribution between parties in the counterfactual congress would be different from that of the real congress. This, in turn, impacts coalition formation, which determines decision-making.

The first step is to diagnose whether legislators' votes are predominantly provincial or partisan. We use Poole and Rosenthal's (2011) W-NOMINATE to aggregate the roll call vote data and identify which factor drives political decisions in congress. W-NOMINATE has been widely employed to analyze the behavior of the United States congresspeople. It produces legislators' *ideal point estimates*, which scale the "ideological" distribution of roll call votes over two dimensions.[4] McCarty (2016) puts forward a more adequate definition of what ideal point estimates actually indicate, coining the term *ideo-lites*. This "ideology-like substance" links choices across different issues, and depicts the consistency in the legislators' behavior over time. Our goal is to compare the *ideo-lites* grouped by province with the ones grouped by party and measure which of them presents a more cohesive behavior and a stronger correlation.[5]

The second step is to evaluate whether malapportionment affects congresses' partisan distributions, which, in turn, affect roll call vote outcomes. We divide this question into two distinct pro-

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[3]Even if local pressure may not determine congressional behavior, Cheibub et al. (2009) demonstrate how governors in Brazil can influence their representatives' behavior in the Chamber of Deputies.

[4]The first dimension refers to left-right orientation. The second dimension refers to social conservatism in terms of values.

[5]Scholars analyzing the US congress use this technique to identify how Democrat and Republican votes differ, and where there may be intra-party cleavages. But in multiparty systems, analyzing these results becomes more challenging, especially when parties' ideologies are not robust or fundamentally distinct for most agendas. Still, if the category used to group the *ideo-lites* is key to understand legislative behavior, there should be identifiable patterns.

cedures. First, using the 2006/7 electoral results and following each country's electoral legislation, we estimate the counterfactual seat distribution between parties according to the naïve-corrected chambers. Then, we run Monte Carlo simulations to predict what would be the counterfactual party and province labels' decisions. We then compare them with the malapportioned ones, to verify if malapportionment systemically changes roll call voting outcomes. Monte Carlo simulations add randomness to an otherwise restricted sample, which makes it possible to perform recurrent tests on a single dataset (Johnson 2011). For the simulation, we assume a simple function for the *ideo-lite* estimates:

$$p_{id} = \alpha_d + \beta_{1d} \text{ Party}_i + \beta_{2d} \text{ Sub-national}_i + \varepsilon_{id} \tag{1}$$

Where p_i represents the ideological position on dimension d for representative i, $Party_i$ indicates the party of representative i, and *Sub-national*$_i$ is the sub-national unit characteristic behavior. β_n represent the empirical estimates for the party and sub-national unit influences obtained by running a linear regression on these labels versus the W-NOMINATE scoring for each of both dimensions. ε_i denotes the error term.

The Monte Carlo data-generating process is meant to produce new, hypothetical votes for the counterfactual legislators. Thus, their behavior must be defined coherently to the province and party they would theoretically belong to (Carsey and Harden 2015). We assume the following: (1) If, in the counterfactual congress, the elected politician originates from the same party and province as a preexisting one from the original dataset, their *ideo-lite* position equals the value predicted by the function, plus a normal disturbance with mean zero and variance matching the data. (2) If, in the counterfactual congress, the elected politician is the sole representative of a province, but there are other representatives from their party in congress, her *ideo-lite* position equals the party average, plus the sub-national unit average, plus a normal disturbance with mean zero and variance matching the data. (3) If, in the counterfactual congress, the elected politician is the sole representative of a party, their *ideo-lite* position equals a randomly drawn party average, plus the sub-national unit average, plus a normal disturbance with mean zero and variance matching the data.

For the simulation results to be comparable to the original outcomes of malapportioned congresses, we manipulate the original dataset in a few steps. Along with the *ideo-lite* positions of the actual country representatives, we estimate the *ideo-lite* positions of the new representatives

according to the rules described above. Then, we include these new ideal points into the sample and exclude all data for legislators who would not have gained a seat in a well-apportioned chamber. After that, we regress each vote against the *ideo-lite* position and use the function to predict that legislator's voting pattern. Finally, we aggregate the results between affirmative (*yea*) and negative (*nay*) votes, studying the most likely outcome in each roll call vote. To verify if malapportionment has any effect, we repeat this process 200 times to produce variability in the simulated scenarios.

Since these countries have different qualified majority laws, we analyze simple majority bills to guarantee that the outcomes are comparable. In Argentina, most laws can be approved by simple majorities. The exceptions, which demand two thirds of chamber approval, are sanctions to presidential, senate, or other institutional vetoes, constitutional amendments, and the exclusion of deputies within the chamber. In Brazil, all laws considered "ordinary" need only simple majority. However, since much of Brazilian ruling is through constitutional amendments, the requirement of two-thirds majority is more common. In Colombia, qualified majority requirements occur in very specific situations, generally related to decisions affecting national security or to sanction members of the government.

4   Results

Figure 1 presents the W-NOMINATE analyses for Argentina, Brazil, and Colombia. On the left are the ideal point estimates by partisanship, and on the right are the results for province of origin. If legislators from the same province vote cohesively, their ideal point estimates form clusters of symbols on the figure. If symbols of the same shape and color are scattered across the chart, the category they assign is probably not strongly correlated with legislators' behavior.

Looking at the Brazilian case, we see that partisanship is a much stronger indicator of legislators' behavior than province of origin. The large clusters inform us that legislators belonging to the same parties had very similar voting patterns in roll calls throughout the term.[6] In contrast, the figure on the left shows the exact same ideal point estimates, but colored according to province of origin. In that case, points of all shapes and colors seem to be almost randomly distributed across the chart, indicating that this classification system is not likely connected to how legislators decide on bills.

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[6]Zucco Jr and Lauderdale (2011) analyze a number of reasons besides ideology to explain why and how partisanship is a strong indicator of legislative behavior in Brazil.

Figure 1: W-NOMINATE scores by party and sub-national units
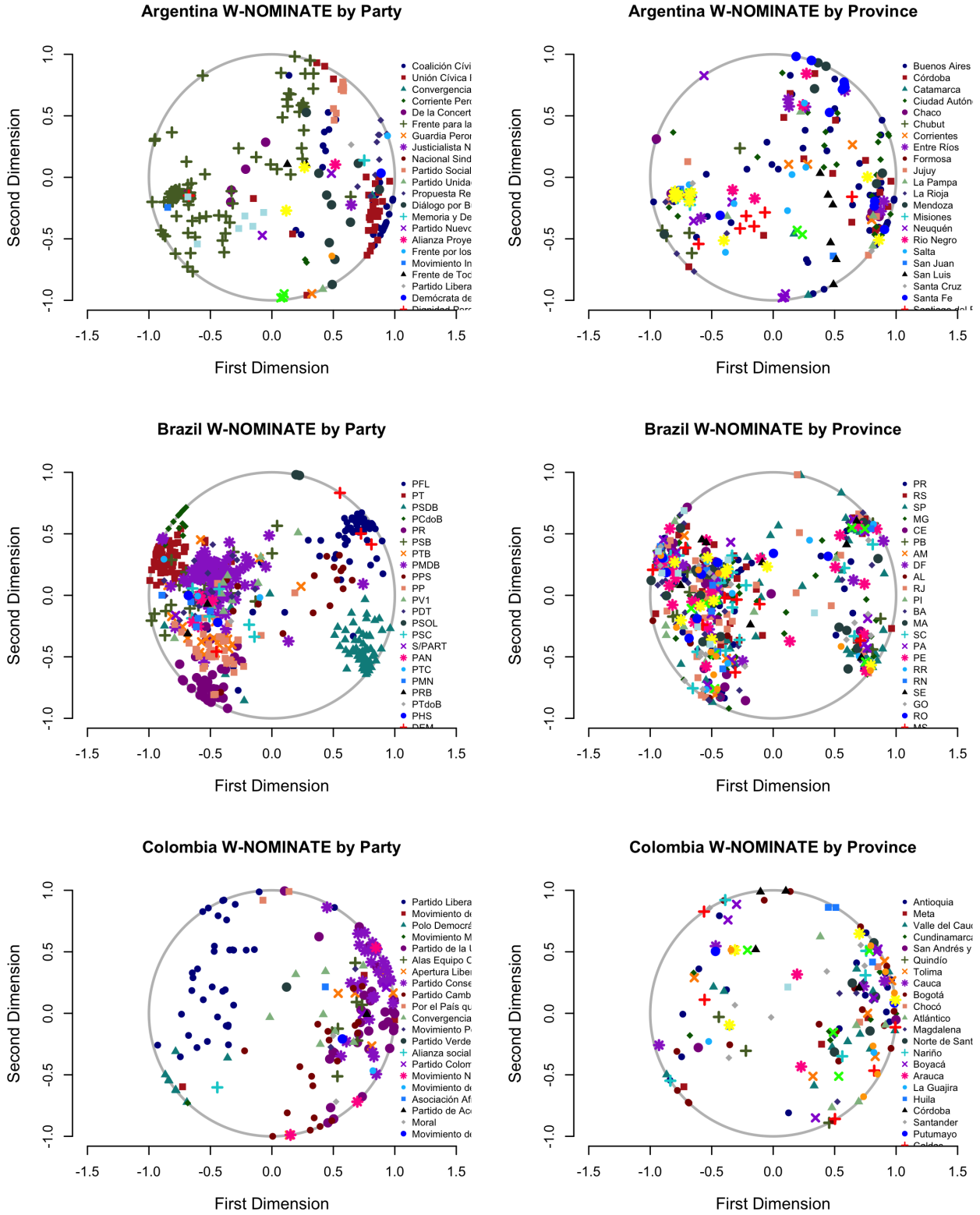
For instance, to the left, we see that the state of PE (Pernambuco), indicated by six-pointed, pink stars, has legislators above and below zero in both dimensions. This informs us that politicians from Pernambuco state have very distinct voting patterns. The interpretation for the Argentinian and Colombian cases is similar, although partisan behavior seems slightly weaker. Also, in Argentina, there is an identifiable degree of provincial behavior related specifically to Santa Fe and Mendoza, on the far right of the circle. A general interpretation of these scores indicates that legislators do not necessarily vote according to conflicting interests between sub-national units, but following an ideological (partisan) standpoint.

Thus, if legislators do not vote provincially, we have some reason to believe that malapportionment would affect voting outcomes if provinces have different party preferences. In this case, a province that is over-represented by the rules of malapportionment may be benefiting a specific party to gain more seats than it should. Along the same lines, the underrepresentation of a state may be reducing the seat share of a party that could otherwise be much stronger. Thus, parties may function as the mediator for the effects of province-based malapportionment. The reason for shifting decisions would not necessarily be that states have competing interests, but the fact that their majorities have opposing ideologies.

Although Figure 1 is informative on its own, we cannot directly infer that sub-national units have no influence on the *ideo-lite* position of legislators. To confirm that this is the case, we run variance analyses[7] on the first and second dimensions of the W-NOMINATE scaling out the influence of party labels and province of origin. The results confirm the straightforward interpretation of the W-NOMINATE plots. Partisanship is a stronger predictor of legislative behavior than provincialism. This trend is observable in parliament dynamics where sub-national unit leaders are often not official entities, while parties and party-leaders hold considerable power, who have considerable influence (Carrubba et al. 2008; Chiou and Rothenberg 2003). Although provincial behavior is less pronounced than partisanship, Argentina presents a significant sub-national unit influence in both dimensions. This is likely due to the strength of its regional parties and blocks, in contrast with Colombia's weak regional politics.

Based on the results so far, if malapportioning seats influences legislative outcomes, the reason behind it is differential party preference across sub-national units, and not necessarily provincial behavior. Tables 4, 5, and 6 present the estimated counterfactual distribution of seats among parties.

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[7]To see the full results, please refer to the Variance Analysis section (D.1) in the Appendix.

Table 4: Diff. Party Share: Malapportioned vs. Well-Apportioned Congress (**Argentina**)

	Uncorr	Corr	Diff
Frente para la Victoria	63	76	13
Democrata Progresista	2	3	1
Frente Justicia, Union y Libertad	2	3	1
Movimiento Popular Neuquino	1	2	1
Alianza Frente de Todos	2	2	0
Frente Civico y Social	1	1	0
Una Nueva Opcion	1	1	0
Accion por la Republica	1	0	-1
Concert. P/Una Sociedad Justa	1	0	-1
Concertacion UNA	1	0	-1
De la Concertacion	1	0	-1
Democrata Cristiano	1	0	-1
Democrata de Mendoza	1	0	-1
Frente Cordoba Nueva	1	0	-1
Frente de Todos	1	0	-1
Mov de Integracion y Desarrollo	1	0	-1
Partido Liberal de Corrientes	1	0	-1
Santa Fe Federal	1	0	-1
Solidaridad e Igualdad	1	0	-1
Union de Centro Democratico	1	0	-1
Union Peronista	1	0	-1
Afirmacion Para Una Rep Igualitaria	6	4	-2
Alianza Proyecto Sur	3	1	-2
Union Civica Radical	13	11	-2
Dialogo por Buenos Aires	4	1	-3
Partido Socialista	6	3	-3
Propuesta Republicana	10	6	-4
Coalicion Civica	33	13	-20

Table 5: Diff. Party Share: Malapportioned vs. Well-Apportioned Congress (**Brazil**)

	Uncorr	Corr	Diff
PSB	27	36	9
PSDB	66	74	8
PDT	24	26	2
PSOL	3	5	2
PV	13	15	2
PL	23	24	1
PTC	3	4	1
PAN	1	1	0
PMN	3	3	0
PRONA	2	2	0
PFL	65	64	-1
PHS	2	1	-1
PRB	1	0	-1
PSC	9	8	-1
PT do B	1	0	-1
PC do B	13	11	-2
PMDB	89	87	-2
PP	41	38	-3
PTB	22	19	-3
PT	83	79	-4
PPS	22	15	-7

Table 6: Diff. Party Share: Malapportioned vs. Well-Apportioned Congress (**Colombia**)

	Uncorr	Corr	Diff
Polo Democratico Alternativo	7	12	5
Partido Cambio Radical	20	24	4
Movimiento Alianza Social Indígena	0	1	1
Partido Colombia Democratica	2	3	1
Partido Conservador Colombiano	29	30	1
Huila Nuevo y Liberalismo	2	2	0
Moral	1	1	0
Movimiento De Participación Popular	1	1	0
Movimiento Nacional	2	2	0
Movimiento Nacional Progresista	1	1	0
Movimiento Popular Unido	2	2	0
Partido De Accion Social	1	1	0
Por el Pais que Soñamos	2	2	0
Movimiento De Integración Regional	4	3	-1
Movimiento De Salvacion Nacional	1	0	-1
Movimiento MIRA	1	0	-1
Movimiento Alas Equipo Colombia	8	6	-2
Movimiento Apertura Liberal	5	3	-2
Partido Convergencia Ciudadana	8	6	-2
Partido Liberal Colombiano	35	33	-2
Partido Social De Unidad Nacional	29	26	-3

The results show that Argentina's party distribution becomes more unbalanced with proportional apportionment. When the system is more proportional, the largest party – Frente para la Victoria – becomes overwhelmingly majoritarian and most smaller parties lose either all or significant amounts of seats. This is an expected result, as malapportionment was deliberately envisioned to produce more consociative democracy. Outcomes are more balanced in the Brazilian case. The left-leaning government party PT (Worker's Party) loses some seats, but so does the opposition's PPS (People's Socialist Party). While the PSB (Brazilian Socialists) – which forms a coalition with PT – wins nine seats, the right-leaning PSDB (Social Democrats) wins eight. In Colombia, we see the smallest aggregate change. Most small parties do not lose seats. Based on the new partisan distributions of congress seats, we expect malapportionment to have a strong effect on Argentinian legislative outcomes, moderate effects in Brazil, and close to no effects in Colombia.

Figure 2 shows the results of the Monte Carlo simulations. For each country, we test the full sample of simple majority bills on the left. To the right, we use a sub-sample of the highly competitive bills, where the decision was within a 60-40 split, where the marginal legislator is more relevant. The *correct predictions* translate the share of roll call votes that had the same result in real congress and in the simulation. High percentages mean that malapportioned and well-apportioned chamber decisions were very similar, and that malapportionment barely changed legislative outcomes. Low percentages mean that the well-apportioned chamber's decisions differ from those of the actual assembly, and that malapportionment more significantly changed the course of lawmaking.

Argentina's *Camara de Diputados* voted on 238 laws between 2008 and 2010, and approved all but six of them. Twenty-two (9.24%) were competitive, and simple majority approved 21 of them. Our simulated floors resulted in the same voting outcomes as the real Argentinian congress in 89.92% of the time. But when it comes to actually competitive legislation, only 44.98% of bills would have the same outcome. Brazil's *Câmara dos Deputados* voted 280 bills between 2007 and 2010, and approved 135, rejecting 146. The Brazilian case is thus more unpredictable because the Executive sends bills to the congress floor without properly weighing how they will be received (Ames 2002). The counterfactual congress would vote just like the malapportioned congress 99.2% of the time. Looking only at competitive bills, the theoretical congress would agree with the decision in about 13 of the 15 voted by the real congress. Thus, correcting malapportionment in Brazil would not spark big changes in legislative activity.

Figure 2: Simulation estimates
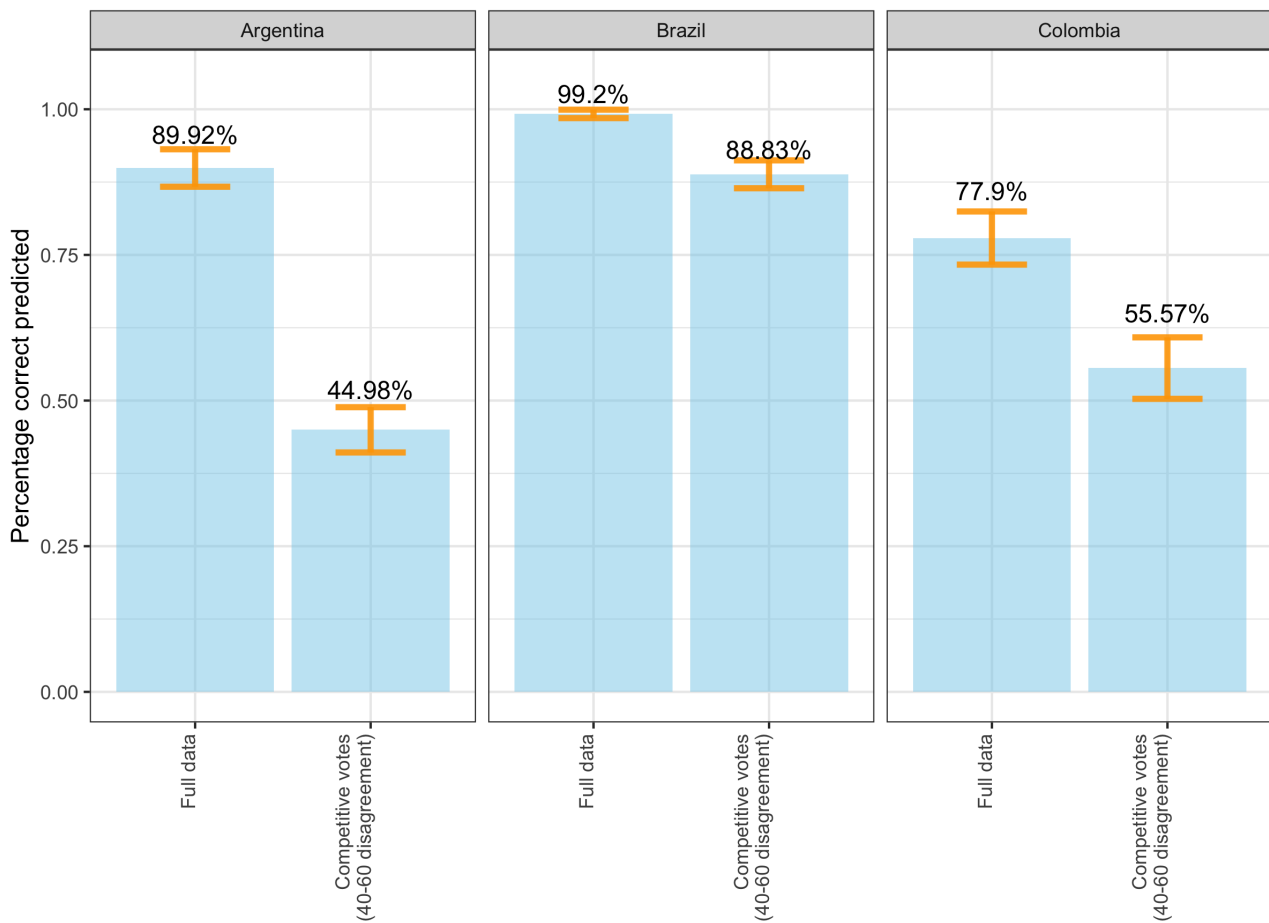
Colombia is the most surprising case, as the direct interpretation of the Monte Carlo simulations goes against the expectations that malapportionment would have weak effects. The Colombian *Congreso* voted 250 laws between 2007 and 2010, approved 107, and rejected 143. Of the 28 competitive bills, 8 were approved. The well-apportioned congress would disagree with the original congress' choices 22.1% of the time in the full sample of simple majority bills. Yet, 44.43% of competitive bills could have alternative outcomes in the counterfactual distribution of seats. This is unexpected since, compared to the other two countries, the distribution of seats between parties did not drastically change. The results, then, indicate that malapportionment has negligible effects for Brazil, but can significantly influence lawmaking in Argentina and Colombia.

5 Discussion

The Argentinian, Brazilian and Colombian cases show that malapportionment distorts representation under specific party system conditions. We see this as Argentina and Colombia, whose indexes were .14, had stronger malapportionment effects than Brazil, whose index was only .05. Yet, there are a few particularities to each country that must be addressed. In simple-majority roll call voting, especially in the analysis of competitive bills, the marginal legislator has decisive power. Hence our effort in designing an accurate rule to predict individually how the new legislators who compose congress would vote. This is a key point in the methodology, as the utility we attribute to these theoretical legislators derives directly from the party and province scores measured in the W-NOMINATES. Yet, if party behavior is not homogeneous, the party scores may not accurately translate the position of partisans. This means there is a degree of particularism that estimates cannot capture, which makes predictions less precise. While the three scenarios are comparable for being PR systems, their open and closed-list electoral rules, and unique party dynamics must be taken into account to interpret the simulation results.

Argentina presented the strongest, most straightforward results to support our hypothesis. Correcting the distortions in the chamber of deputies changes the distribution of seats among parties. This cancels out consociational democracy efforts by making small parties disappear. It also reflects a scenario where the opposition is not effective, constituting a tyranny of the majority based on *Frente para la Victoria*'s winning coalition. Even so, the provincial effect is not negligible. Argentina has strong sub-national party systems operating alongside and within the national party system (Gibson and Suárez-Cao 2010). This helps us understand why, for Argentina, provinces have a stronger input on decisions according to the W-NOMINATE ANOVA analysis.[8] Roll call vote outcomes thus change considerably due to the strength of sub-national party system and of the winning coalition.

Comparing Brazil to Colombia sheds light on counterintuitive dynamics that take place in each country, making them all the more interesting. While Brazil is an open-list PR system, Colombia elects representatives through closed lists. Highly personalistic campaigns and candidates generally manifest in open-list PR, translating heated intra-party competition (Mershon 2020). Party leaders have great difficulty in disciplining elected politicians whose platform and strategy are truly personalistic. Thus, in open-list PR, we should observe heterogeneous party behavior in congress roll

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[8]Please refer to the full results of variance analysis on the Appendix.

call votes. In closed-list PR, intra-party competition would be much less rampant during elections, and voters would not witness it in campaigns. Instead, it would have taken place *before* the election, when the party forms its list(s).

Brazil and Colombia reverse the open versus closed list pattern, and the results presented here corroborate this idea. We find regional interests are not significant in either country. In Brazil, most party leaders can discipline their politicians almost perfectly, and intra-party competition is moderate (Figueiredo and Limongi 2000). Desposato (2006) demonstrate that the Brazilian lower chamber does not suffer from many of the malicious open-list PR effects reported in the classic electoral system literature. Recent findings show that the number of effective running candidates is low, and that they are mostly members of large parties who internally coordinate to maximize the number of seats awarded to the label as a whole (Cheibub and Sin 2020). In spite of malapportionment, partisan seat distribution remains balanced compared to the counterfactual correction, and parties effectively discipline their incumbents. Thus, a reform to reduce distortion would not be highly beneficial – as the real outcomes are not far from those of an "ideal" apportionment.

Leongómez and Mainwaring (2006) finds the Colombian party system is fragmented with personalistic and undisciplined legislators. This explains the number of "independent" parties, whose officeholders often abstain from openly aligning with either the government (conservatives) or the opposition (liberals). Legislators' disloyalty to parties may also be an individual signaling strategy to extremist constituents, as Kirkland and Slapin (2018) suggest happens in British and American assemblies. Each party can launch as many lists as it likes, and most lists elect only the first candidate.[9] Citizens thus vote for the list head, who is not coordinated with other candidates from their label.

W-NOMINATE estimates reflect the indiscipline of Colombian legislators visually: we do not see clusters of party behavior as markedly as for the other two countries. This is because politicians in the same party act autonomously, which translates into heterogeneous voting patterns. Moreover, if partisanship is but a pretext (Leongómez and Mainwaring 2006), the party scores may not generate very accurate predictions of behavior, which affects the simulation results. If the scores we based on are not highly predictive, the constructed legislators for the well-apportioned chamber may be too disordered. Besides, one can also argue that the Colombian results are the least conclusive, since

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[9]For instance, in 2002, of the 321 lists running for the upper house, only 3 elected more than one senator (Leongómez and Mainwaring 2006).

Colombia's index after correction is actually very close to Brazil's starting malapportionment index.

Moreover, the cleavages dividing Colombian politics have their axis around the first dimension (right-left positions) in Figure 1. We can clearly see former President Uribe's coalition, composed of the Conservative Party, the "U" Party (*Partido Social de Unidad Nacional*), the Radical Change Party (*Cambio Radical*), and the Liberal Opening Movement (*Apertura Liberal*), occupying the right half of the plot. On the left, there are the Liberal Party and the Alternative Democratic Pole (*Polo Democrático Alternativo*, the FARC party). The winning coalition seems incontestable in Colombia when it comes to central matters such as national security and the state's strategy to combat militias. Thus, it must be acknowledged that the highly competitive bills from Colombia may be low-yield issues, or centered around the second dimension axis, such as minority rights. Although malapportionment may alter these voting outcomes, the bills that shape national politics may not be affected by the disproportionate seat distribution.

6   Conclusion

In this paper we evaluate whether malapportionment in national congresses changes legislative outcomes. We analyze the cases of three PR systems (Argentina, Brazil, and Colombia) during the period of 2007-2010. We find that some characteristics of each political system have considerable influence on the scale of malapportionment effects. Party politics play an especially important part, since majority formation determines decision-making in assemblies. It is important to note that the results here represent a partial-equilibrium analysis. It dismisses the conjecture that, under different electoral rules, parties', politicians', and voters' strategies would be different, and perhaps so would their agendas. Yet, the exercise we perform remains valid, as we measure the impacts of malapportionment against a reapportioned counterfactual that purely corrects distortions. It is shown to be an adequate method to assess the impact that malapportionment can have on lawmaking.

This paper makes three contributions to the scholarship. First, it empirically identifies how some electoral rules affect representation (Carey and Hix 2011; Pierzgalski 2018) and other institutional features, such as accountability (Myerson 1993), public good provision (Lizzeri and Persico 2001), and even corruption (Persson et al. 2003). Second, the paper advances the literature on malapportionment and its effects, following Mignozzetti et al. (2011) in the Brazilian case. Third and last, we add to a broader research effort employing partial-equilibrium simulations to evaluate the effects of

institutional features, demonstrating how they can be used in the case of legislator distribution.

This study, however, does not perform a predictive evaluation of reapportionment reforms. Because it does not address all of the costs reform incurs, we advise against its direct use to motivate, or to discourage institutional change. As we have pointed out, real world political negotiation would most certainly veto naïve corrections. End results would likely be an immense increase in the size of national chambers, in which case, our results do not necessarily apply. Although a recent meta-analysis (Alptekin et al. 2020) shows that larger chambers do not necessarily spend more, they might produce other forms of resource misallocation, especially in countries plagued by corruption and high coordination costs. Building on this point, we highlight the importance of a qualitative assessment of the bills to evaluate the scope and scale of the transformations that reapportionment could produce. This paper may be used as a stepping stone for further investigation, so that future endeavors might estimate what real proposals to reapportion legislative chambers could and should look like.

References

Alptekin, H., Freire, D., Mignozzetti, U., and Roman, C. (2020). The Effect of Legislature Size on Public Spending: A Meta-Analysis. *Working Paper*.

Ames, B. (2002). *The Deadlock of Democracy in Brazil*. University of Michigan Press.

Ardanaz, M. and Scartascini, C. (2013). Inequality and Personal Income Taxation: The Origins and Effects of Legislative Malapportionment. *Comparative Political Studies*, 46(12):1636–1663.

Brancati, D. (2008). The Origins and Strengths of Regional Parties. *British Journal of Political Science*, 38(1):135–159.

Brasil, B. (2018). Segundo Mais Caro do Mundo, Congresso Brasileiro Tem Parlamentares Demais? https://www.bbc.com/portuguese/brasil-46427803.

Bruhn, M., Gallego, F., and Onorato, M. (2010). *Legislative Malapportionment and Institutional Persistence*. The World Bank.

Bunker, K. and Navia, P. (2010). Explicando la Desproporcionalidad en América Latina: Magnitud de Distrito, Malapportionment y Fragmentación Partidaria. *Revista Española de Ciencia Política*, 23:81–110.

Carey, J. M. (2016). Malapportionment and Ideological Bias in Chilean Electoral Districts. *Latin American Politics and Society*, 58(3):123–133.

Carey, J. M. and Hix, S. (2011). The Electoral Sweet Spot: Low-Magnitude Proportional Electoral Systems. *American Journal of Political Science*, 55(2):383–397.

Carrubba, C., Gabel, M., and Hug, S. (2008). Legislative Voting Behavior, Seen and Unseen: A Theory of Roll-Call Vote Selection. *Legislative Studies Quarterly*, 33(4):543–572.

Carsey, T. M. and Harden, J. J. (2015). Can You Repeat that please?: Using Monte Carlo Simulation in Graduate Quantitative Research Methods Classes. *Journal of Political Science Education*, 11(1):94–107.

CEBRAP, T. (2020). CEBRAP Brazilian Roll Call Vote Databases. http://cebrap.org.br/en/home-en/.

Cheibub, J. A., Figueiredo, A., and Limongi, F. (2009). Political Parties and Governors as Determinants of Legislative Behavior in Brazil's Chamber of Deputies, 1988–2006. *Latin American Politics and Society*, 51(1):1–30.

Cheibub, J. A. and Sin, G. (2020). Preference Vote and Intra-Party Competition in Open List PR Systems. *Journal of Theoretical Politics*, 32(1):70–95.

Chiou, F.-Y. and Rothenberg, L. S. (2003). When Pivotal Politics Meets Partisan Politics. *American Journal of Political Science*, 47(3):503–522.

Congreso Visible Uniandes (2020). Congreso Visible: Colombian Roll Call Vote Database. `https://congresovisible.uniandes.edu.co/votaciones/`.

Dahl, R. A. (1973). *Polyarchy: Participation and Opposition*. Yale University Press.

De Tocqueville, A. (2003). *Democracy in America*, volume 10. Regnery Publishing.

DecadaVotada Application (2020). Decada Votada Diputados' roll call vote databases. `http://www.decadavotada.com.ar`.

Desposato, S. W. (2006). The Impact of Electoral Rules on Legislative Parties: Lessons from the Brazilian Senate and Chamber of Deputies. *The Journal of Politics*, 68(4):1018–1030.

Figueiredo, A. C. and Limongi, F. (2000). Presidential Power, Legislative Organization, and Party Behavior in Brazil. *Comparative Politics*, pages 151–170.

Freire, D., Mignozzetti, U. G., and Cepaluni, G. (2019). Legislature Size and Welfare: Evidence from Brazil. *Working Paper*.

Gallagher, M. (1991). Proportionality, Disproportionality and Electoral System. *Electoral studies*, 10(1):33–51.

Gibson, E. L. and Suárez-Cao, J. (2010). Federalized Party Systems and Subnational Party Competition: Theory and an Empirical Application to Argentina. *Comparative Politics*, 43(1):21–39.

Horiuchi, Y. (2004). Malapportionment and Income Inequality: A Cross-National Analysis. *British Journal of Political Science*, 34(1):179–183.

Johnson, P. E. (2011). Monte Carlo Analysis in Academic Research. *Oxford Handbook of Quantitative Methods in Psychology*, 1.

Kirkland, J. H. and Slapin, J. B. (2018). *Roll Call Rebels: Strategic Dissent in the United States and United Kingdom.* Cambridge University Press.

Leongómez, E. P. and Mainwaring, S. (2006). Giants with Feet of Clay: Political Parties in Colombia. *The crisis of democratic representation in the Andes*, page 78.

Lijphart, A. (1968). Consociational Democracy. *World Pol.*, 21:207.

Lizzeri, A. and Persico, N. (2001). The Provision of Public Goods under Alternative Electoral Incentives. *American Economic Review*, 91(1):225–239.

Loosemore, J. and Hanby, V. J. (1971). The Theoretical Limits of Maximum Distortion: Some Analytic Expressions for Electoral Systems. *British Journal of Political Science*, 1(4):467–477.

McCarty, N. (2016). In Defense of DW-Nominate. *Studies in American Political Development*, 30(2):172–184.

Mershon, C. (2020). Challenging the Wisdom on Preferential Proportional Representation. *Journal of Theoretical Politics*, 32(1):168–182.

Mignozzetti, U. G., Bernabel, R., and Galdino, M. (2011). Faz Alguma Diferença Corrigir as Distorções de Representação no Brasil? *Um Estudo Sobre a Interação entre a Arena Eleitoral e a Arena Legislativa no Âmbito Federal. In: Cadernos Adenauer XII*, 2.

Ministerio del Interior (2020). Resultados electorales y estadíticas. https://www.argentina.gob.ar/interior/dine/resultadosyestadisticas/2007#2.

Mustapic, A. M. et al. (2002). Argentina: La Crisis de Representación y los Partidos Políticos. *América Latina Hoy*, pages 163–183.

Myerson, R. B. (1993). Incentives to Cultivate Favored Minorities under Alternative Electoral Systems. *American Political Science Review*, pages 856–869.

Nicolau, J. M. (1997). As distorções na Representação dos Estados na Câmara dos Deputados Brasileira. *Dados*, 40(3).

Persson, T., Tabellini, G., and Trebbi, F. (2003). Electoral Rules and Corruption. *journal of the European Economic Association*, 1(4):958–989.

Pierzgalski, M. (2018). Balancing Disproportionality and Parliament Fragmentation: A Simulation Study of the Mechanical Effects of District Magnitude on Electoral Outcomes. *Electoral Studies*, 54:205–217.

Poole, K. T. and Rosenthal, H. L. (2011). *Ideology and Congress*, volume 1. Transaction Publishers.

Rae, D. W. (1967). *The Political Consequences of Electoral Laws*. New Haven: Yale University Press.

Registraduría Nacional de Colombia (2020). Congreso electoral result database. `https://www.registraduria.gov.co/-Congreso,3637-.html`.

Samuels, D. and Snyder, R. (2001a). Devaluing the Vote in Latin America. *Journal of Democracy*, 12(1):146–159.

Samuels, D. and Snyder, R. (2001b). The Value of a Vote: Malapportionment in Comparative Perspective. *British Journal of Political Science*, pages 651–671.

Samuels, D. J. and Snyder, R. (2004). Legislative Malapportionment in Latin America.

Superior Court of Electoral Justice (2020). National Electoral Data Repository (Brazil). `https://www.tse.jus.br/eleicoes/estatisticas/repositorio-de-dados-eleitorais-1/repositorio-de-dados-eleitorais`.

Turgeon, M. and Cavalcante, P. (2014). Desproporcionalidade da Representação dos Estados no Congresso Nacional e seus Efeitos na alocação dos Recursos Federais. Technical report, Texto para Discussão.

Uslaner, E. M. and Zittel, T. (2006). Comparative Legislative Behavior. In *The Oxford Handbook of Political Science*.

Zucco Jr, C. (2009). Ideology or What? Legislative Behavior in Multiparty Presidential Settings. *The Journal of Politics*, 71(3):1076–1092.

Zucco Jr, C. and Lauderdale, B. E. (2011). Distinguishing between Influences on Brazilian Legislative Behavior. *Legislative Studies Quarterly*, 36(3):363–396.

Appendix (For Online Publication)

A   Introduction

This appendix presents supplementary materials for the paper *Legislative Outcomes and Malapportionment: Evidence from Latin America.* Here you will find illustrative content that helps get a clearer diagnosis of the scale of malapportionment in the cases studied, as well as parts of the analysis that contributed to the main results, but were not included in the article, such as the ANOVAs for ideal point estimates.

B   Diagnosing Malapportionment

To aid foreign readers get a visual depiction of the geographical patterns of malapportionment, we present self-produced heat maps representing the population/seat ratio. This means the provinces/states in a deeper tone of red are overrepresented, and those that have a lighter shade of yellow are underrepresented.
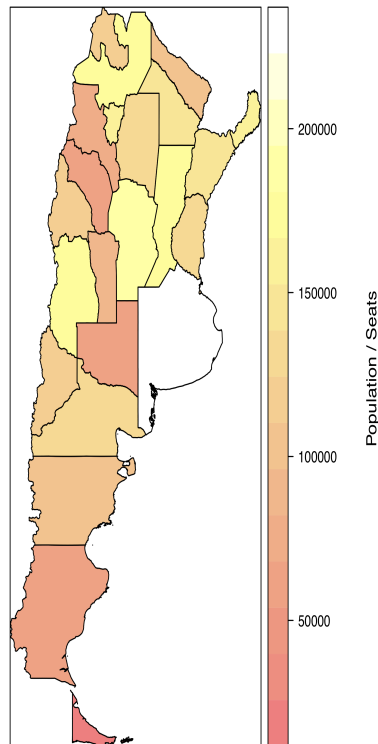
Figure 3: Argentinian Scale of Malapportionment per *Provincia*
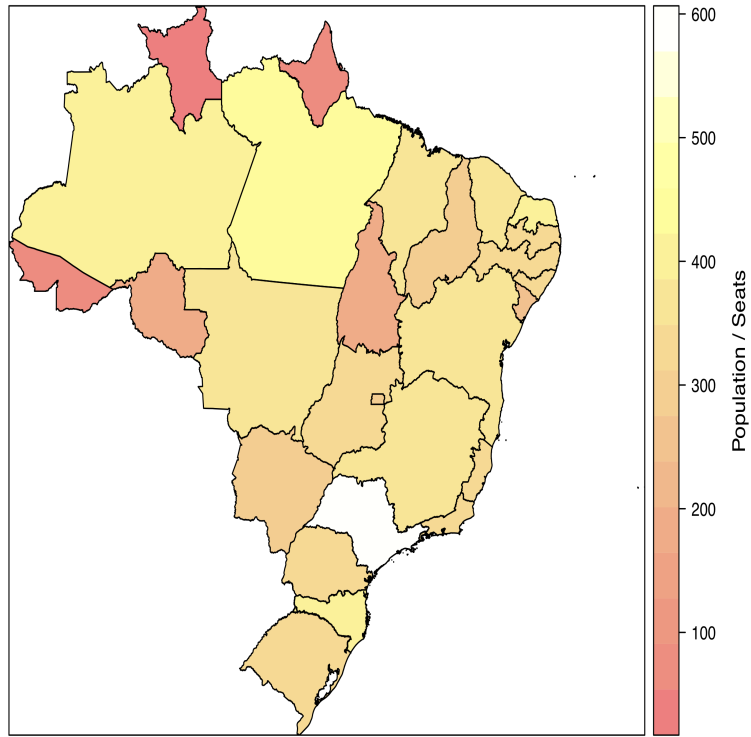
Figure 4: Brazilian Scale of Malapportionment per *Estado* (Population in thousands)
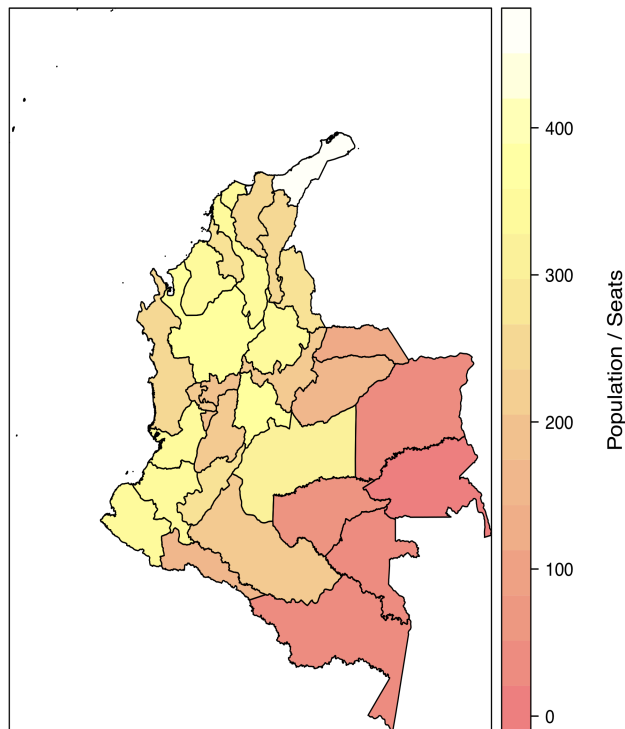

Figure 5: Colombian Scale of Malapportionment per *Departamiento* (Population in thousands)

The maps are but an illustration of the analysis we propose in the main paper. The disparities are large in all three countries, with a slight difference in cause. In Argentina and Brazil, the problem

seems to be one of underrepresentation of very populous urban centers, while in Colombia, the issue is of overrepresentation of a large number of sparsely populated *departamientos*.

C   Reapportionment: Naïve Correction

The correction we propose is naïve. It is based on the idea that each province is entitled to one single legislator, and the rest of the chamber is filled in by proportional amounts of representatives from the more populated provinces.

We will illustrate the procedure with the Argentinian case, but the same logic applies to Brazil and Colombia. Considering that the Argentinian Congress was composed of 256 legislators, and we wished to maintain the size of the chamber very close to the original, a proportional apportionment would assign one representative to every 0.39% of the national population (1/256 equals a share of one legislator for 0.0039*population). According to Table 7, Tierra del Fuego, the smallest province in Argentina, has a population of 127,205, which represents a share of 0.00317 of the population. Even though Tierra del Fuego does not reach the .39% requirement, no province can go unrepresented, and it is thus entitled to a single representative, in contrast to the 5 it has in reality under malapportionment. Looking at the other extreme, Buenos Aires and its population of 15,625,084, or 39% of the Argentinian population, is assigned the amount of 100 representatives.

D   Determining Provincial vs. Partisan Behavior

This section will shed further light into the W-NOMINATE analysis and its procedures, its use in parliaments other than the US Congress, and its appropriate forms of interpretation.

D.1   Variance Analysis

While the W-NOMINATE figures are highly informative, we performed a variance analysis for Argentina, Brazil, and Colombia to infer which variable was more predictive of legislative behavior: province of origin or partisanship. For the sake of clarity, we also present the same figures that are in the article, but amplified. The plots follow the ANOVA regression results in each W-NOMINATE dimension.

Table 7: Malapportionment in Argentina 2007 national elections

	Provinces	Population	Share of Population	Pop / Seats Malap.	Pop / Seats Reap.
1	Catamarca	367828	0.00917	73565.60	183914
2	Chubut	509108	0.01269	101821.60	169702.67
3	Formosa	530162	0.01321	106032.40	176720.67
4	La Pampa	318951	0.00795	63790.20	159475.50
5	La Rioja	333642	0.00832	66728.40	166821
6	NeuquEn	551266	0.01374	110253.20	137816.50
7	Rio Negro	638645	0.01592	127729	159661.25
8	San Luis	432310	0.01055	86462	144103.33
9	Santa Cruz	273964	0.00683	54792.80	136982
10	Tierra del Fuego	127205	0.00317	25441	127205
11	Jujuy	673307	0.01678	112217.83	168326.75
12	San Juan	681055	0.01698	113509.17	170263.75
13	Chaco	1055259	0.0263	150751.29	150751.29
14	Corrientes	992595	0.02474	141799.29	165432.50
15	Misiones	1101593	0.02746	157370.43	157370.43
16	Salta	1214441	0.03027	173491.57	151805.12
17	Santiago del Estero	874006	0.02179	124858	145667.67
18	Entre Rios	1235994	0.03081	137332.67	154499.25
19	Tucuman	1448188	0.0359	160909.78	160909.78
20	Mendoza	1738929	0.043365	173892.90	158084.45
21	Cordoba	3308876	0.08248	183826.44	157565.52
22	Santa Fe	3194537	0.07963	168133.53	159726.85
23	Ciudad Buenos Aires	2890151	0.07204	115606.04	152113.21
24	Buenos Aires	15625084	0.38949	223215.49	156250.84
	Total	40117096	1	156097.65	156707.41
	Standard Deviation			46938.28	12906.85
	Malapp. Index			0.14	0.01

D.1.1 Argentina

Table 8: Contrib. Parties / States on legislative behavior (Argentina)

	First Dimension				
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Party contributions	24	89.18	3.72	44.71	0.000
Province contributions	23	6.30	0.27	3.30	0.000
Residuals	208	17.28	0.08		
	Second Dimension				
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Party contributions	24	13.01	0.54	5.04	0.000
Province contributions	23	5.11	0.22	2.07	0.004
Residuals	208	22.37	0.11		

Argentina has a clear province-level pattern of political behavior. Although the first dimension is mostly captured by parties (almost 90%), the second is one-third explained by province level behavior.

W−NOMINATE Coordinates

Legend:
- Buenos Aires
- Córdoba
- Catamarca
- Ciudad Autónoma de
- Chaco
- Chubut
- Corrientes
- Entre Ríos
- Formosa
- Jujuy
- La Pampa
- La Rioja
- Mendoza
- Misiones
- Neuquén
- Rio Negro
- Salta
- San Juan
- San Luis
- Santa Cruz
- Santa Fe
- Santiago del Estero
- Tierra del Fuego
- Tucumán
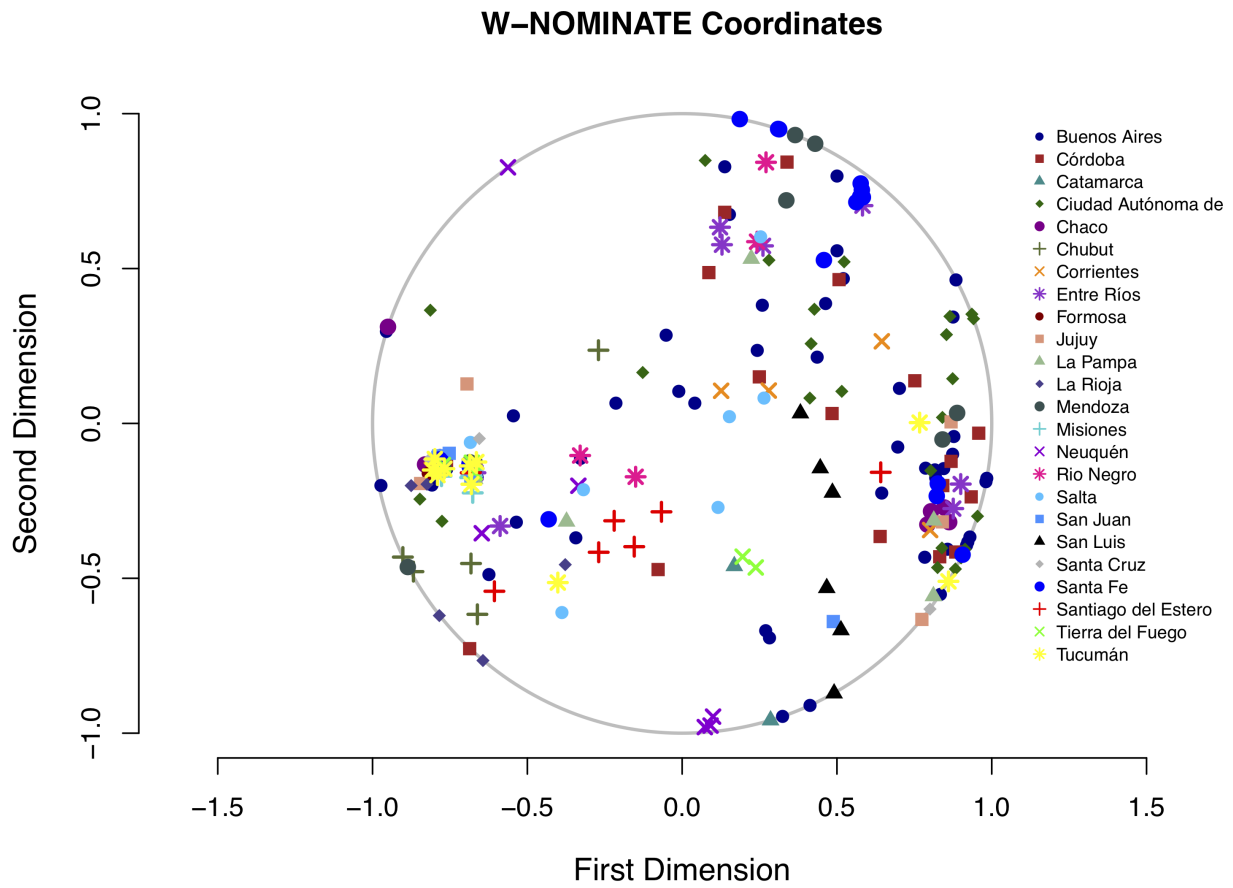
Figure 6: Argentinian Ideal Point Estimates per *Provincia*
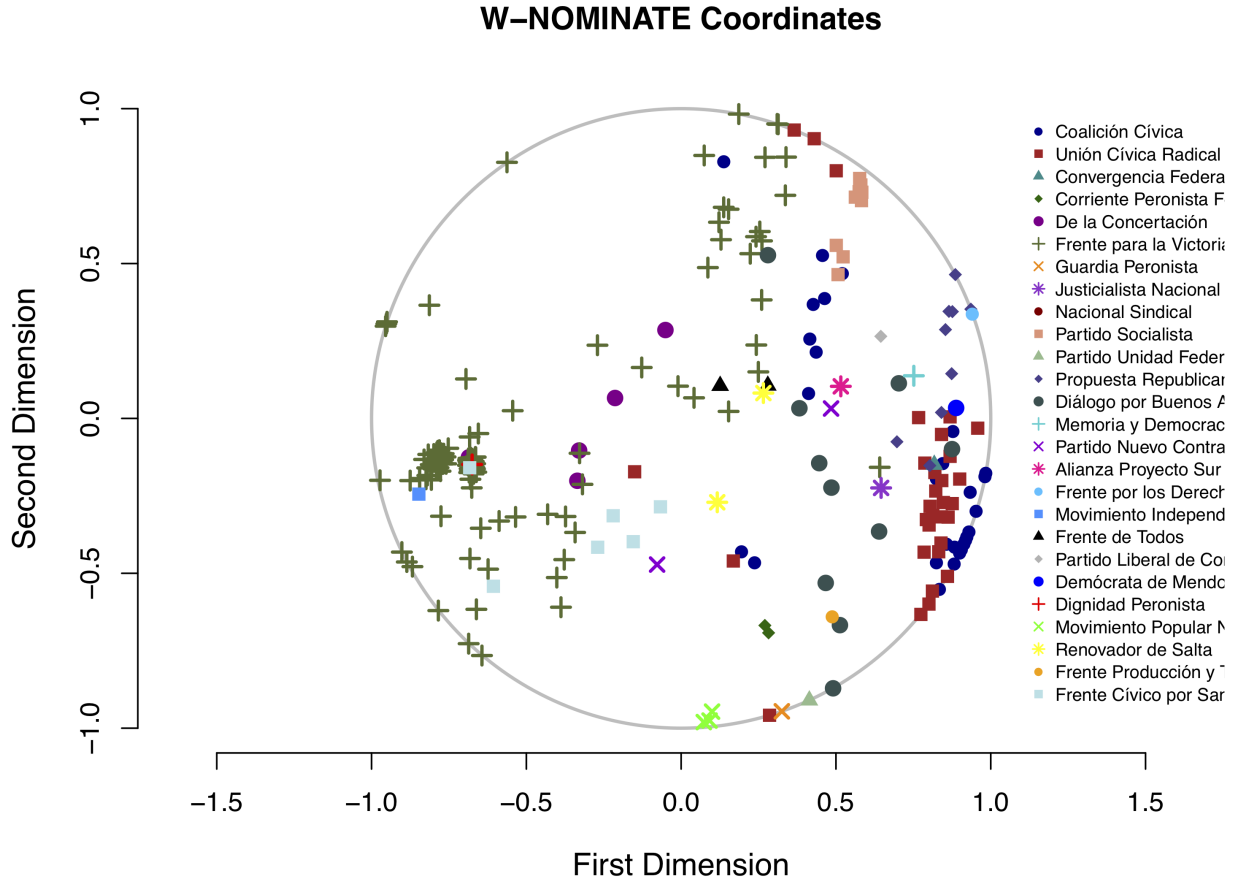
W–NOMINATE Coordinates

Figure 7: Argentinian Ideal Point Estimates per Party

D.1.2 Brazil

Table 9: Contrib. Parties / States on legislative behavior (Brazil)

	First Dimension				
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Party contributions	21.00	142.02	6.76	112.45	0.00
Province contributions	26.00	3.68	0.14	2.35	0.00
Residuals	475.00	28.57	0.06		
	Second Dimension				
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Party contributions	21.00	63.08	3.00	75.32	0.00
Province contributions	26.00	1.48	0.06	1.43	0.08
Residuals	475.00	18.94	0.04		

As the results evidence, a small influence is significant. However, if we compare the sum of squares for each component, we see that the provinces have negligible explanatory power, and parties seem to better account for the voting patterns.
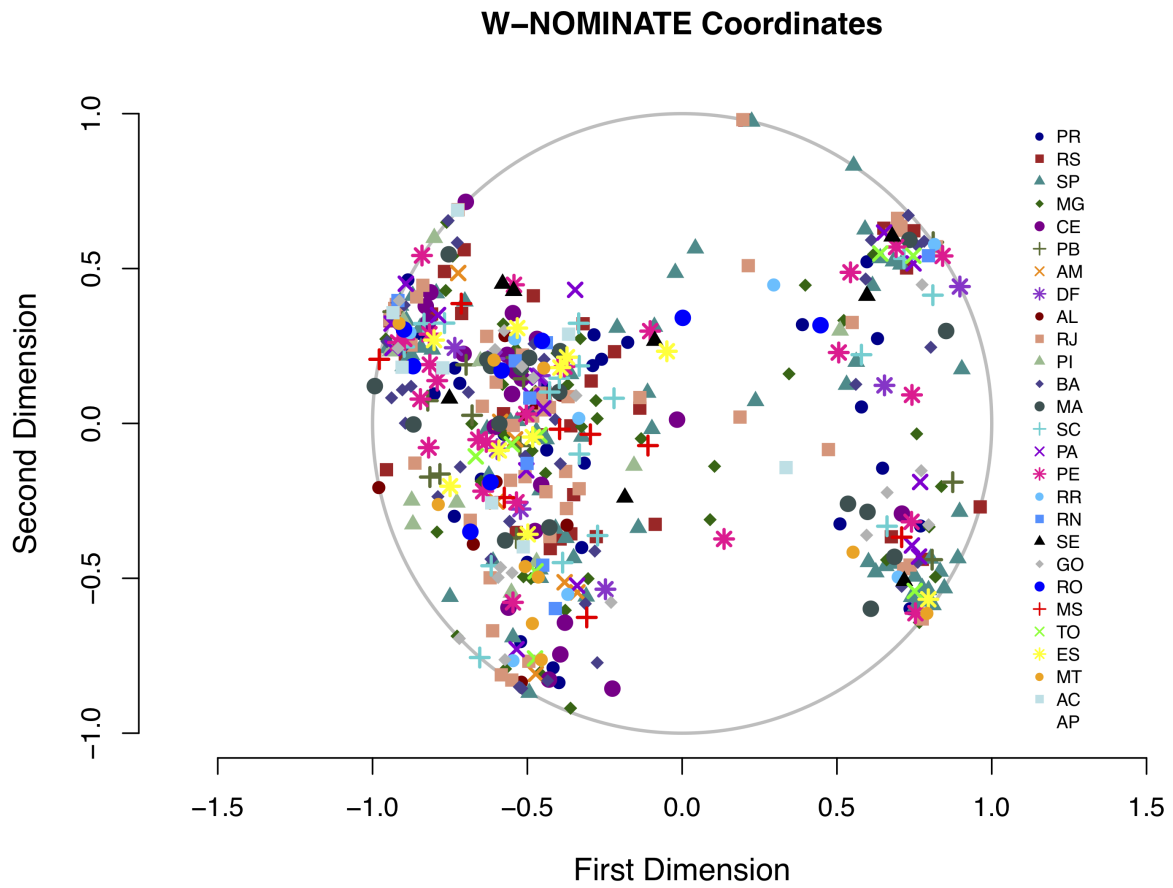
W−NOMINATE Coordinates

Figure 8: Brazilian Ideal Point Estimates per *Estado*
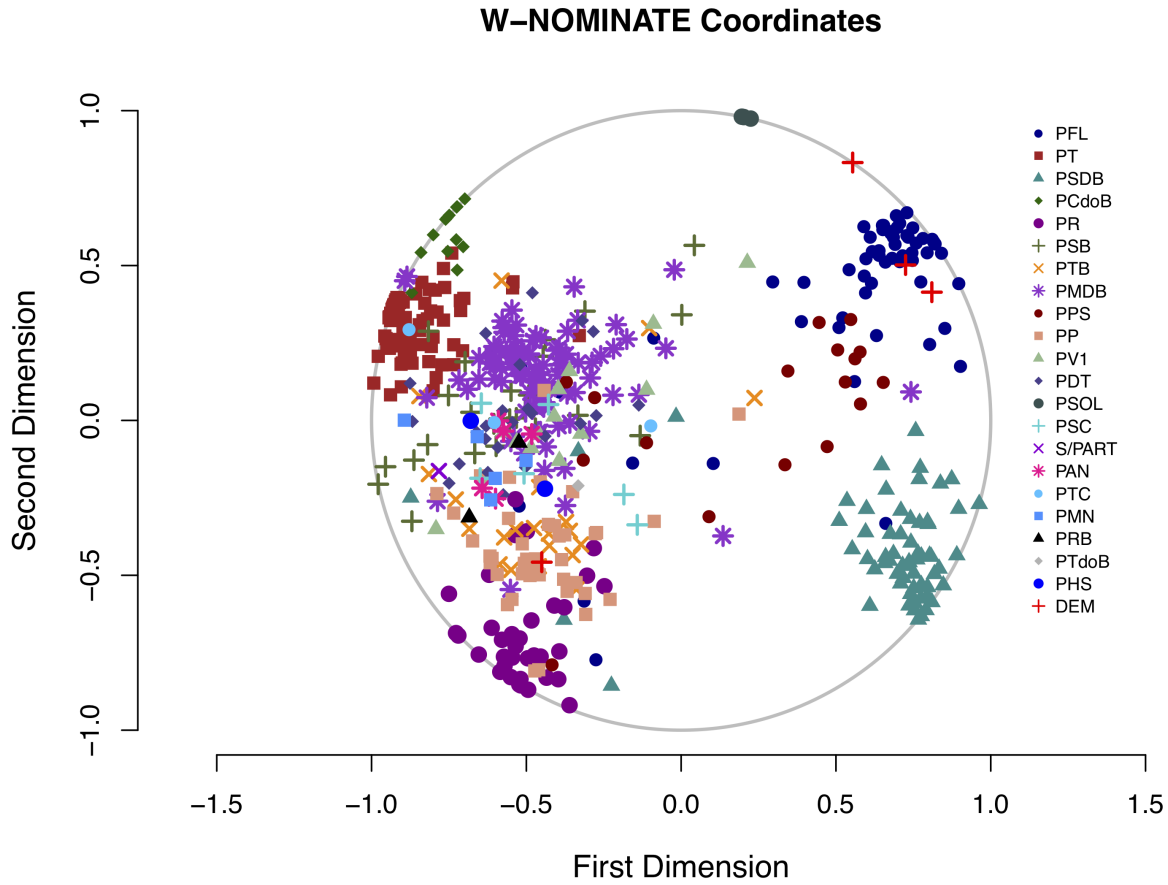
W−NOMINATE Coordinates

Figure 9: Brazilian Ideal Point Estimates per Party

D.1.3   Colombia

Table 10: Contrib. Parties / States on legislative behavior (Colombia)

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
First Dimension					
Party contributions	20.00	47.60	2.38	40.66	0.00
Province contributions	34.00	1.77	0.05	0.89	0.64
Residuals	115.00	6.73	0.06		
Second Dimension					
Party contributions	20.00	15.26	0.76	5.34	0.00
Province contributions	34.00	5.69	0.17	1.17	0.27
Residuals	115.00	16.42	0.14		

Statistically speaking, the provincial contribution on legislative behavior is zero. This is remarkable since the Colombian electoral system and legislation are very similar to the Argentinian.

W−NOMINATE Coordinates

Legend:
- Antioquia
- Meta
- Valle del Cauca
- Cundinamarca
- San Andrés y Providε
- Quindío
- Tolima
- Cauca
- Bogotá
- Chocó
- Atlántico
- Magdalena
- Norte de Santander
- Nariño
- Boyacá
- Arauca
- La Guajira
- Huila
- Córdoba
- Santander
- Putumayo
- Caldas
- Cesar
- Risaralda
- Bolívar
- Minorías Políticas
- Caquetá
- Vichada
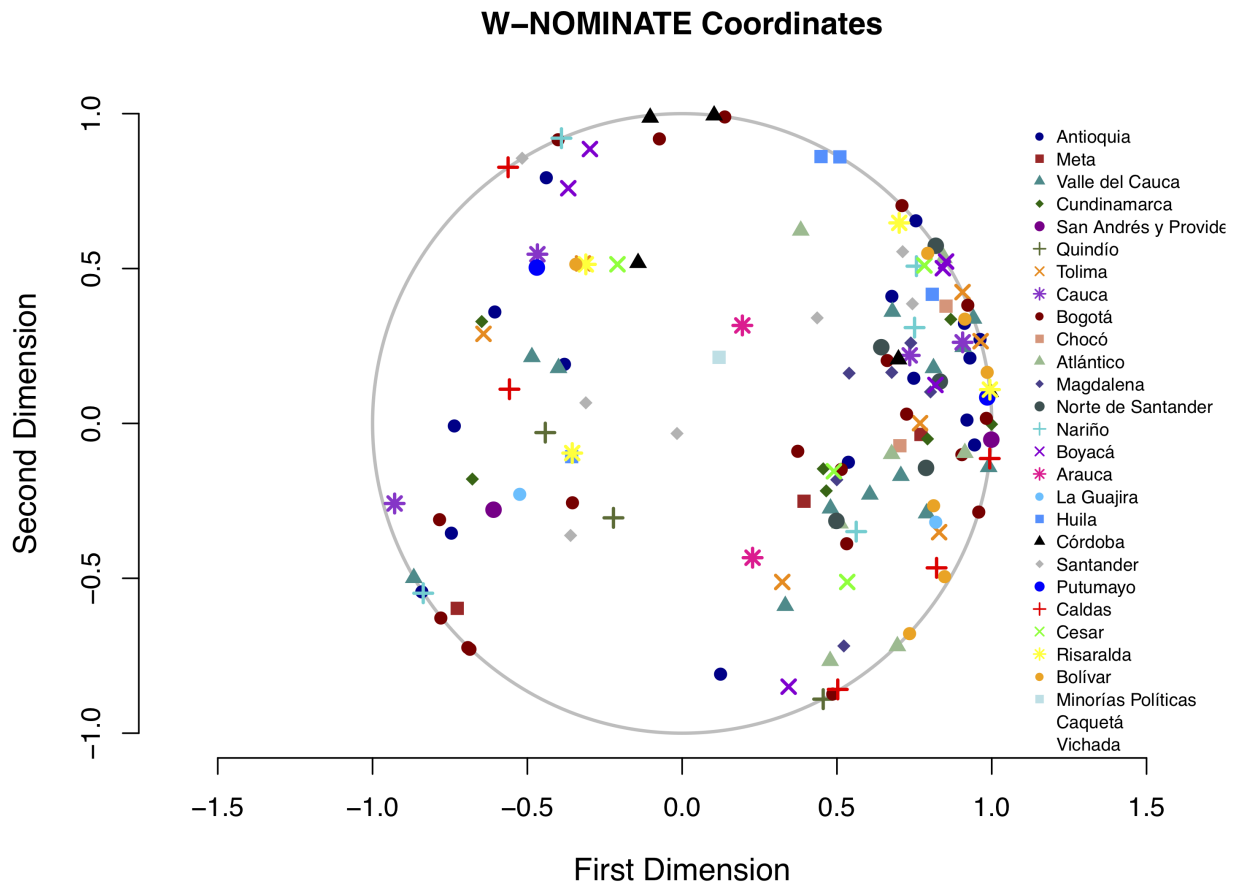
Figure 10: Colombian Ideal Point Estimates per *Departamiento*

W−NOMINATE Coordinates

Legend:
- Partido Liberal Colom
- Movimiento de Integra
- Polo Democrático Alte
- Movimiento MIRA
- Partido de la U
- Alas Equipo Colombi
- Apertura Liberal
- Partido Conservador
- Partido Cambio Radic
- Por el País que Soña
- Convergencia Ciudad
- Movimiento Popular U
- Partido Verde Opción
- Alianza social afrocol
- Partido Colombia Den
- Movimiento Nacional
- Movimiento de Salva
- Asociación Afrouninca
- Partido de Acción So
- Moral
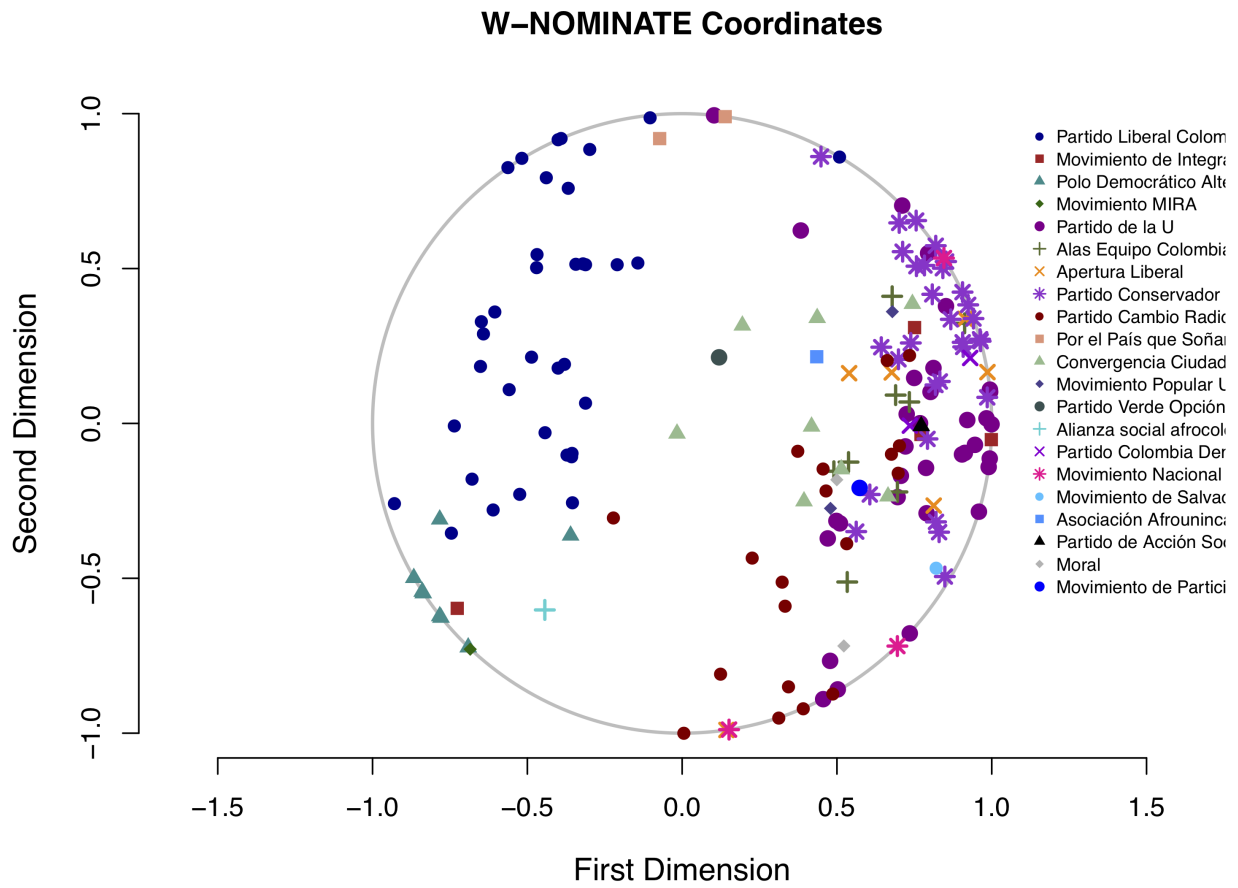- Movimiento de Partici

Figure 11: Colombian Ideal Point Estimates per Party

E Acronyms and Abbreviations

Table 11: Brazilian Party Labels

Acronym	Name
PSB	Brazilian Socialist Party
PSDB	Brazilian Social Democratic Party
PDT	Democratic Labor Party
PSOL	Socialism and Liberty Party
PV	Green Party
PL	Liberal Party
PTC	Christian Labor Party
PAN	Party of the Nation's Retirees
PMN	Party of National Mobilization
PRONA	Party of the Reconstruction of the National Order
PFL	Democrats (Liberal Front Party)
PHS	Humanist Party of Solidarity
PRB	Republicans (Brazilian Republican Party)
PSC	Social Christian Party
PT do B	Worker's Party of Brazil
PC do B	Brazilian Communist Party
PMDB	Brazilian Democratic Movement Party
PP	Progressives (Progressive Party)
PTB	Brazilian Worker's Party
PT	Worker's Party
PPS	People's Socialist Party

Table 12: Brazilian State Acronyms

Acronym	State name
AC	Acre
AM	Amazonas
AP	Amapá
DF	Distrito Federal
MS	Mato Grosso do Sul
MT	Mato Grosso
RN	Rio Grande do Norte
RO	Rondonia
RR	Roraima
SE	Sergipe
TO	Tocantins
AL	Alagoas
ES	Espírito Santo
PI	Piauí
PB	Paraíba
SC	Santa Catarina
GO	Goiás
PA	Pará
MA	Maranhão
CE	Ceará
PE	Pernambuco
PR	Paraná
RS	Rio Grande do Sul
BA	Bahia
RJ	Rio de Janeiro
MG	Minas Gerais
SP	Sao Paulo